

REMARKS

Initially, applicants would like to thank Examiner Nguyen for granting an interview and for his time spent in the interview.

Applicants would also like to thank the Examiner for withdrawing the restriction requirement of September 13, 2002.

Claims 1-17 were previously pending in the application. Claims 4 and 14 are canceled and new claims 18-20 are added. Therefore, claims 1-3, 5-13 and 15-20 are presented for consideration.

Claims 1, 2, 4, 5, 7 and 8 are rejected as anticipated by SAKOH 5,641,991. This rejection is respectfully traversed.

Claim 1 is amended and provides that a portion of a silicon contact plug extends beyond a first interlayer insulating film and that a silicide pad contacts an entirety of the portion of the silicon contact plug that extends beyond the first interlayer insulating film.

As pointed out at the interview, SAKOH teaches a polysilicon layer 4 between polysilicon plug 9 and silicide layer 12. See, for example, Figures 5 and 6 of SAKOH. The inclusion of a polysilicon layer 4 between the polysilicon plug 9 and the silicide layer 12 prevents the silicide pad from contacting an entirety of the protruding portion. As the reference does not disclose that which is recited, the anticipation rejection as to claim 1 cannot be maintained.

In addition, claim 1 provides that the silicide pad is formed in a self-aligning manner with the silicon contact plug.

As set forth at the interview, the SAKOH reference and the present invention are commonly assigned to NEC Corporation. Applicants being knowledgeable about the invention underlying SAKOH assert that the polysilicon layer 4 of SAKOH includes a positional shear so that the self-aligning is lost in the process of SAKOH. Accordingly, SAKOH neither teaches that which is recited nor is such feature inherent based on the presence of the positional shear and thus claim 1 is believed patentable over SAKOH.

Claim 2 depends from claim 1 and further defines the invention and is also believed patentable over SAKOH.

Claims 4 and 5 are combined as independent claim 5 and provide that the step of forming a silicide pad includes the steps of selectively and partially removing the insulating film and the silicon at least in the vicinity of the contact plug such that the plug protrudes.

As pointed out at the interview, SAKOH teaches a protruding plug. However, the method of SAKOH is different from that which is recited in claim 5. As pointed out at the interview, column 6, lines 4-11 of SAKOH in describing the process of SAKOH with respect to Figures 2B and 2C disclose that the polysilicon layer 8 is etched back so that there is only material left in hole 7a producing a polysilicon plug 9 in hole

7a shown in Figure 2C. The top end of the plug is slightly lower than the surface of SiO₂ layer 5. The SiO₂ layer 5 is then removed. Removing the SiO₂ layer causes the top part of the plug 9 to protrude slightly from the polysilicon layer 4. In SAKOH, the insulating layer is layer 3. This layer is not selectively and partially removed so that the plug protrudes. Rather, as set forth above, the SiO₂ layer 5 is removed such that the plug protrudes.

As SAKOH does not disclose the recited method steps, the anticipation rejection of claim 5 cannot be maintained.

Claim 7 is amended and provides that the polysilicon contact plug protrudes from a second surface of the first insulating layer so as to form a protrusion. Claim 7 further provides that a silicide pad contacts an entirety of the protrusion. The analysis above regarding claim 1 is equally applicable to claim 7. Claim 8 depends from claim 7 and further defines the invention and is able believed patentable over SAKOH.

Claims 3 and 6 are rejected as unpatentable over SAKOH in view of IWATA et al. 6,291,861. This rejection is respectfully traversed.

IWATA et al. is only cited for the teaching of using cobalt as a refractory metal. IWATA et al. do not teach or suggest what is recited in claims 1 and 5. As set forth above, SAKOH does not disclose or suggest what is recited in claims 1 and 5. Since claims 3 and 6 depend from claims 1 and 5,

respectively, and further define the invention, the proposed combination of references would not render obvious claims 3 and 6.

Claims 9 and 15 are rejected as unpatentable over SAKOH in view of WIECZOREK et al. 6,271,122 in view of the Examiner's further remarks. This rejection is respectfully traversed.

WIECZOREK et al. is only cited for the teaching of molybdenum, tantalum and cobalt silicide. WIECZOREK et al. do not teach or suggest what is recited in claim 7. As set forth above, SAKOH does not disclose what is recited in claim 7. Since claim 9 depends from claim 7 and further defines the invention, the proposed combination of references would not render obvious claim 9.

Claim 15 depends from claim 13 which provides selecting and partially removing a first insulating film and a polysilicon layer at least in the vicinity of the polysilicon plug such that the polysilicon plug protrudes from the first interlayer insulating layer. Such recitation is similar to that of claim 5. As set forth above, SAKOH does not disclose or suggest this feature. WIECZOREK et al. also do not teach or suggest this feature. Accordingly, the proposed combination of references would not render obvious claim 15.

Claim 10 is rejected as unpatentable over SAKOH in view of WU et al. 5,998,251, WIECZOREK et al. and in view of the Examiner's remarks. This rejection is respectfully traversed.

WU et al. is only cited for the teaching of a tungsten conductive plug, second interlayer insulating film and an aluminum copper layer. WU et al. do not teach or suggest what is recited in claim 7. As set forth above, SAKOH does not disclose or suggest what is recited in claim 7. Since claim 10 depends from claim 7 and further defines the invention, the proposed combination of references would not render obvious claim 10.

Claims 11 and 12 are rejected as unpatentable over SAKOH in view of HUANG 6,096,595. This rejection is respectfully traversed.

Claim 11 is amended and provides that the polysilicon contact plug has a protruding portion extending beyond a first interlayer insulating film. Claim 11 further provides that a silicide pad is formed on the protruding portion so that the silicide pad contacts an entirety of the protruding portion.

The analysis above regarding claim 1 with respect to SAKOH is equally applicable to claim 11. HUANG is only cited for the teaching of a second insulating layer on top of a first insulating layer. HUANG does not teach or suggest that a silicide pad contacts an entirety of a protruding portion.

The above-noted feature is missing from each of the references, is absent from the combination and thus would not be obvious to one having ordinary skill in the art.

Claim 12 depends from claim 11 and further defines the invention and is also believed patentable over the proposed combination of references.

Claims 13 and 14 are rejected as unpatentable over SAKOH in view of the Examiner's further remarks. This rejection is respectfully traversed.

Claims 13 and 14 are combined as independent claim 13 and includes the step of selectively and partially removing a first insulating film and a polysilicon layer at least in the vicinity of the polysilicon plug such that the polysilicon plug protrudes from the first interlayer insulating layer.

Such a feature is similar to that which is recited in claim 5. As set forth above, as discussed at the interview, SAKOH does not teach or suggest this method step. Accordingly, claim 13 is believed patentable over SAKOH.

Claims 16 and 17 are rejected as unpatentable over SAKOH in view of WU et al., WIECZOREK et al. and in view of the Examiner's further remarks. This rejection is respectfully traversed.

Claim 16 depends from claim 13 and further defines the invention. None of the cited references teaches or suggests selectively and partially removing a first insulating film and a polysilicon layer at least in the vicinity of the polysilicon plug such that the polysilicon plug protrudes from the first interlayer insulating layer as recited in claim 13. Since claim

16 would at least include the limitations of claim 13, the proposed combination of references would not render obvious claim 16.

Claim 17 is amended and includes the step of selectively and partially removing an insulating film and silicon at least in the vicinity of a contact plug such that the plug protrudes. Such recitation is similar to that of claim 5. As set forth above, such limitation was discussed at the interview and was pointed out at the interview that the proposed combination of references does not teach or suggest this feature.

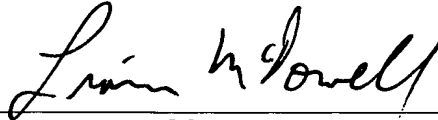
New claims 18-20 further define the invention and are also believed patentable over the cited prior art. Support for the new claims can be found on page 9, lines 6-15, for example.

In view of the present amendment and the foregoing remarks, it is believed that the present application has been placed in condition for allowance. Reconsideration and allowance are respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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